User manual

Multifunctional units

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1.1 Advanced electronics

The control logic, developed by Thermocold, allows to satisfy cooling and heating demand. In case of simultaneous heating and cooling demand, the unit exchanges the condensation and evaporation heat respectively with the cold circuit and the hot circuit of the plant.
When the thermal load are not balanced, or one of the two is absent, the unit uses automatically a third heat source, which can be depending on the model, the air or the water.

1.2 Display description

Through the LED display, you can monitor and change the status of the unit, using the 6 buttons positioned in the lower part of the keypad
Available information on display:

By pressing the UP and DOWN keys on the Home screen, you can view the following values:

- "**LP1**": Display of pressure of the low pressure line;
- "**EIn**": Displays the water temperature at the exchanger inlet air-conditioning;

- "**Eout**": Displays the temperature of the water leaving the exchanger of air-conditioning;
- "**Et**": Displays the outside air temperature (only for air / water);
- "**Pcond**": Display of pressure of the high pressure branch;
- "**SIn**": Displays the water temperature at the exchanger inlet domestic hot water;
- "**SOut**": Displays the temperature of the water leaving the exchanger of domestic hot water (if present);
- "**COut**": Displays the temperature of the water leaving the exchanger of source side (only for water / water).

In addition to the input buttons in the menus listed below, are also present in the home screen and buttons that allow you to activate the machine operation respectively in summer and winter operation.

The display shows **OnC** when the unit is on and chiller, **OnH** when the unit is turned on in heat pump, **OnR** when the unit is only hot water production, **OnCr** with chiller unit more sanitary and **Stby** when the unit is key to OFF.

Description of the icons on the display:

°C -°F BAR-PSI	On when the screens display temperature or pressure
	On in programming if the screens display temperature or pressure set points/differentials
	On during programming if the lower screen displays the working hours of the loads or the time. Flashing in functions menu if the remaining time to the beginning of defrost is displayed.
	Flashing on if alarms not identified by specific icons are present
Vset	On if an automatic Set Point change function is active (Dynamic set point, Energy Saving)
menu	On during menu navigation
	On if the heaters (antifreeze/support) are on
Flow!	Flashing on if the digital input of the flow is active when the pump is on; with the pump off it says that the flow contact is closed
	On if at least one of the water pumps is on
	On if at least one fan is on
	On if the relative compressor is on; flashing if the compressor is switched on with a timer
	On if the auxiliary output is active

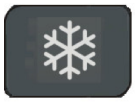
	On if the machine is on and represents the Heat or Cool mode of operation based on the logic set in the CF31 parameter
Cir1 Cir2	Cir1 on if in view values for circuit 1 Cir2 on if in view values for circuit 2
	The icon is flashing on when counting the interval between defrosting sessions; the icon is steady on during the defrosting phase

1.2.1 Buttons description and their functions

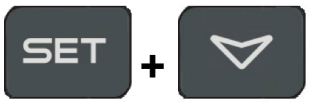
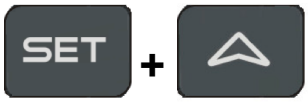
The controller is provided with six buttons to interact with user and installer parameters.

Here below the description of the accessible operations through the buttons.

SET	**Press and release in the main display:** It allows you to visualize the chiller (label SETC) or heat pump (label SetH) set point
	Press and release 2 times in the main display: If the energy saving or dynamic set point is enabled for machines without storage, the icon Vset is lit and the display shows the work real set
	Press for 3 seconds and release in the main display: It allows you to edit the chiller / heat pump set point
	Press and release in the ALrM menu: It allows you to reset the alarm (if this alarm can be reset) from the menu ALrM
^	**Press and release:** from the main display it allows you to show the values of the configured probes (temperature / pressure) in the upper display, and the corresponding label in the lower display.
	Press and release in the PrG menu: it allows to slide in the parameters folders (ST, CT, etc.) and in the parameters list. In parameter editing phase, it increases the value.
v	**Press and release:** from the main display it allows you to show the values of the configured probes (temperature / pressure) in the upper display, and the corresponding label in the lower display.
	Press and release in the PrG menu: it allows to slide in the parameters folders (ST, CT, etc.) and in the parameters list. In parameter editing phase, it increases the value.

	Press and release: It provides access to menu functions
	Press for 3 seconds and release: it allows you to adjust the watch in the provided models.
	Press and release in the PrG menu: it quits the parameter change.
	**Press and release:** it allows you to switch on the machine on heat pump or select standby mode
	Press and release: it allows you to switch on the machine on chiller or select standby mode

Some controller functions are available through the multiple keys simultaneous pressure; following are the combinations accepted by the controller.

	**Simultaneous pressure of buttons for 3 seconds:** it allows to access to parameters programming
	**Simultaneous pressure of buttons:** 1. it allows to quit from parameters programming 2. the simultaneous extended pressure of the buttons active the manual defrost

2.1 On/Off of the unit

WARNING: Supply power to the unit at least 8 hours before the startup, penalty the annulment of the warranty.

Pressing or for about three seconds it can switch on the machine in chiller or heat pump mode. During these 3 seconds, the selected mode led flashes.

To change machine mode, for example to pass from chiller to heat pump mode, it must passing to the standby mode before.
If the controller is on, the extended pressure on the button of the current mode (chiller or heat pump) forces the machine on standby.
In standby mode, you can still to enter in menu to change the parameters.
Alarm management is enabled also in standby mode; alarms that occur are equally shown.

2.2 Remote control of the unit

It is possibile to control the unit remotely with two different methods:

- Free contacts on the user terminal (X);
- ModBus protocol on RS485 serial port master or slave;

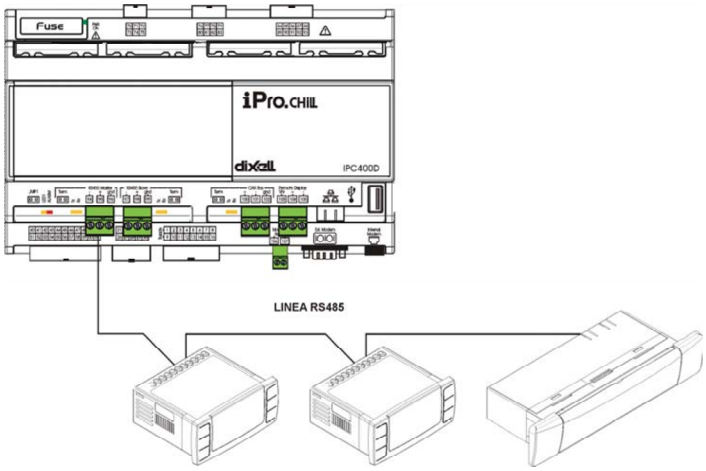
2.2.1 Controlling the unit remotely by means of free contacts

On the X user terminal there are four free terminals where you can connect any type of temperature control device able to provide a current pulse to close the relay for the unit activation.
The terminals are those with the numbers 6, 20, 22B, 23 and 29, on the X user terminal (always refer to the wiring diagram included), this contact is generally a normally open contact.
With these contacts you can enable remote On/Off, S/W change, wire plant side and domestetic hot water flow switches, and you can enable the "**Only Recovery**" function.
You can enable the "**Only Recovery**" function by key only using the remote display.
To enable the remote S/W changing you need modify **SP9**.
On the same terminal are also available free contacts for external reporting of general alarm.

2.2.2 Controlling the unit remotely by means of ModBus protocol

On the control device installed on the unit, an input is available for serial connection on RS485 port with ModBus protocol, to use this type of connection please observe the wiring diagram below, observing a bus type connection, and avoiding to create stars.

You can use the master and slave RS485 port, depending on the location of the instrument in the network.



To connect to the devices to be controlled simply use two minimum cross-section of 0.5 mm2 plus screen, use the input GND only for communication problems.

3 Alarm display

Enter to the function menu:

1. Select **"ALrM"** function using or ;
2. Press and release **;**
3. The pressure on or allows to show active alarms.

Press the Menu key or wait the timeout, to exit to this visualization.

3.1 Alarm reset

1. Enter to the function menu;
2. Select the function **"ALrM"**;
3. Press ; lower display shows the alarm while the upper display shows the label **rSt** if the alarm is resettable, or **NO** if it isn't. Using or you can slide and show all active alarms**;**
4. Press on the label **rSt** to reset alarm and pass to the next;
5. Press the Menu key or wait the timeout, to exit to this visualization.

4 Set point display

Pressing and releasing the SET button, it can see the setpoint value, **SetC** (set chiller) if the machine is on the chiller mode, or **SetH** (set heat pump) if the machine is on the heat pump mode.

Pressing and releasing the SET button when the machine is on the standby mode, it is possible to display both set points.

4.1 Set point editing

1. Press the SET key at least for 3 sec;
2. The set point will display blinking;
3. To modify set point value, press ^ and v ;
4. Press the SET key, or wait the timeout to save the new value and to quit from programming;

5 Configuration parameters

Controller parameters grouped in functional folders (**CF** = configuration, **CO** = compressor,...) with a specific label each.
The generic group **ALL** contain all controller parameters.

5.1 How to edit user level parameters (Pr1)

How to enter in "**Pr1**":

1. Press SET and v for some seconds;
2. Icons flash and upper display shows "**ALL**" (generic parameters group);

3. Slide the parameters groups using and ;

4. Select the group that contains parameters to edit. Pressing the set button, you can enter in the parameters list of that group.
   Lower display shows parameter label and the upper its value.

5.2 How to edit parameters value

1. Enter in the parameters menu;

2. Select parameter;

3. Press the key to eneble the edit;

4. You can edit the value using or ;

5. Press the button to save the new value and to move to the next;

6. To exit, press the key, when you are in parameters viewing (not during the change with blinking value), or wait the timeout.

NOTE:

The new value is saved also, when you quit because of timeout without pressing the button.

WARNING:

you can change the CF (configuration parameters) group parameters values, when the machine is on standby mode or on remote OFF, only.

You cannot change dF parameters if the unit is on defrost mode.

5.3 Parameters table

The parameters are grouped by macro-groups, as follows:

ST	Thermoregulation parameters
SD	Dynamic set point parameters
ES	Energy saving parameters
FS	Sanitary water parameters
SP	Remote S/W & Automatic Change Over

Thermoregulation parameters					
Parameters	Description	min	max	u.m.	Risolution
ST1	**Summer set point**	ST02	ST03	°C/°F	dec/int
ST4	**Winter set point**	ST04	ST05	°C/°F	Dec/ int
Dynamic set point					
Parameters	Description	min	max	u.m.	Risolution
Sd1	**Summer dynamic set point offset max**	-50.0	110.0	°C	Dec
Sd2	**Winter dynamic set point offset max**	-50.0	110.0	°C	Dec
Sd3	**Summer set external air temperature**	-50.0	110	°C	Dec
Sd4	**Winter set external air temperature**	-50.0	110	°C	Dec
Sd5	**Summer differential external air temperature**	-50.0	110.0	°C	Dec
Sd6	**Winter differential external air temperature**	-50.0	110.0	°C	Dec
Energy Saving					
Parameters	Description	min	max	u.m.	Risolution
ES1	**Time band 1 begin**	0	23.50	Min	10 min
ES2	**Time band 1 end**	0	23.50	Min	10 min
ES3	**Time band 2 begin**	ES2	23.50	Min	10 min
ES4	**Time band 2 end**	0	23.50	Min	10 min
ES5	**Time band 3 begin**	ES4	23.50	Min	10 min

ES6	**Time band 3 end**	0	23.50	Min	10 min
ES7	**Monday** **0 = No time band** **1 = Time band 1** **2 = Time band 2** **3 = Time band 1 & 2** **4 = Time band 3** **5 = Time band 1 & 3** **6 = Time band 2 & 3** **7 = All time band**	0	7		
ES8	**Tuesday** **0 = No time band** **1 = Time band 1** **2 = Time band 2** **3 = Time band 1 & 2** **4 = Time band 3** **5 = Time band 1 & 3** **6 = Time band 2 & 3** **7 = All time band**	0	7		
ES9	**Wednesday** **0 = No time band** **1 = Time band 1** **2 = Time band 2** **3 = Time band 1 & 2** **4 = Time band 3** **5 = Time band 1 & 3** **6 = Time band 2 & 3** **7 = All time band**	0	7		
ES10	**Thursday** **0 = No time band** **1 = Time band 1** **2 = Time band 2** **3 = Time band 1 & 2** **4 = Time band 3** **5 = Time band 1 & 3** **6 = Time band 2 & 3** **7 = All time band**	0	7		
ES11	**Friday** **0 = No time band** **1 = Time band 1** **2 = Time band 2** **3 = Time band 1 & 2** **4 = Time band 3** **5 = Time band 1 & 3** **6 = Time band 2 & 3** **7 = All time band**	0	7		

ES12	**Saturday** **0 = No time band** **1 = Time band 1** **2 = Time band 2** **3 = Time band 1 & 2** **4 = Time band 3** **5 = Time band 1 & 3** **6 = Time band 2 & 3** **7 = All time band**	0	7		
ES13	**Sunday** **0 = No time band** **1 = Time band 1** **2 = Time band 2** **3 = Time band 1 & 2** **4 = Time band 3** **5 = Time band 1 & 3** **6 = Time band 2 & 3** **7 = All time band**	0	7		
ES14	**Summer increase set energy saving**	-50.0	110.0	°C	Dec
ES15	**Summer differential Energy saving**	0.1	25.0	°C	Dec
ES16	**Winter increase set energy saving**	-50.0	110.0	°C	Dec
ES17	**Winter differential Energy saving**	0.1	25.0	°C	Dec
Automatic on/off by time band					
ES18	**Monday** **0 = No time band** **1 = Time band 1** **2 = Time band 2** **3 = Time band 1 & 2** **4 = Time band 3** **5 = Time band 1 & 3** **6 = Time band 2 & 3** **7 = All time band**	0	7		

ES19	**Tuesday** **0 = No time band** **1 = Time band 1** **2 = Time band 2** **3 = Time band 1 & 2** **4 = Time band 3** **5 = Time band 1 & 3** **6 = Time band 2 & 3** **7 = All time band**	0	7		
ES20	**Wednesday** **0 = No time band** **1 = Time band 1** **2 = Time band 2** **3 = Time band 1 & 2** **4 = Time band 3** **5 = Time band 1 & 3** **6 = Time band 2 & 3** **7 = All time band**	0	7		
ES21	**Thursday** **0 = No time band** **1 = Time band 1** **2 = Time band 2** **3 = Time band 1 & 2** **4 = Time band 3** **5 = Time band 1 & 3** **6 = Time band 2 & 3** **7 = All time band**	0	7		
ES22	**Friday** **0 = No time band** **1 = Time band 1** **2 = Time band 2** **3 = Time band 1 & 2** **4 = Time band 3** **5 = Time band 1 & 3** **6 = Time band 2 & 3** **7 = All time band**	0	7		
ES23	**Saturday** **0 = No time band** **1 = Time band 1** **2 = Time band 2** **3 = Time band 1 & 2** **4 = Time band 3** **5 = Time band 1 & 3** **6 = Time band 2 & 3** **7 = All time band**	0	7		

ES24	**Sunday** **0 = No time band** **1 = Time band 1** **2 = Time band 2** **3 = Time band 1 & 2** **4 = Time band 3** **5 = Time band 1 & 3** **6 = Time band 2 & 3** **7 = All time band**	0	7		
Sanitary water parameters					
Parameters	Description	min	max	u.m.	Risolution
FS1	**SW enabling** **0 = Disable** **2 = Enable**	0	2		
FS2	**Priorità di funzionamento** **0 = ACS** **1 = Climatizzazione**	0	1		
FS3	**SW set point**	35.0	55.0	°C	Dec.
Remote S/W & Automatic Change Over					
Parameters	Description	min	max	u.m.	Risolution
SP9	S/W Change 0 = By Keypad 1 = By Digital Input 2 = By Analogic Input	0	2		
SP10	Set Automatic Change Over	-50.0	110.0	°C	Dec.
SP11	Differential Automatic Change Over	0.1	25.0	°C	Dec.

6 Alarms

The controller is able to identify all alarms that may damage the normal operation of the machine. For each alarm code, the controller performs a given action.

Below is a table with the alarm codes.

Alarm code	Description
AP"x"	Failure on probe "x"
b1HP	High pressure switch alarm
b1LP	Low pressure switch alarm
b1hP	High pressure alarm from transducer
b1lP	Low pressure alarm from transducer
AFFC	Antifreeze alarm
AEFL	Plant side flow alarm
AHFL	Sanitary water flow alarm
APFL	Solar panel flow alarm
ACFL	Source side flow alarm
C1tr	Compressor 1 overload
b1tF	Condenser fan overload
AtE1	Evaporator pump overload
AtC1	Condenser pump overload
b1dF	Defrost alarm
C1Mn	Compressor 1 maintenance request
AEP1	Evaporator pump maintenance request
ACP1	Condenser pump maintenance request
C1dt	High discharge temperature compressor 1
OPC1	Oil compressor 1 pressure switch
AEht	High temperature evaporator water inlet
ACF"x"	Configuration alarm "x"
APS	Phases sequence alarm
ALc1	Generic alarm 1

7 Remote display

The remote terminal is connected directly to the controller connectors designed for the remote keypad, paying particular attention to the polarity of the connections.

Wrong wiring may cause serious damage to the keyboard or controller.